TITLE: RANDOM INPUT MULTISTAGE VOLTAGE TRICKLE STORAGE SYSTEM

BACKGROUND OF THE INVENTION

(a) Field of the Invention

The present invention is related to a random input multistage voltage trickle storage system, and more particularly, to a circuit system functioning as a storage by voltage difference of two or more than two stages comprised of two or more than two types of storage device, to store DC source converted from city power, or charging energy randomly inputted from unstable source such as a solar cell or a windmill generator.

(b) Description of the Prior Art:

The prior art involves the input of DC converted from AC using contact type conduction structure for random coupling, or using electric energy outputted from a solar cell or a windmill generator or other unstable sources, such as tide generation or vibration generation to drive the load of random operation. However, during the operation, the power supply is frequently disconnected due to lacking in immediate power supply of random operation by contact type conduction interface, or being affected by ambient factors in case of solar or wind energy, or instability in tide or vibration energy. To cope with these defectives, batteries are added to ensure a consistent supply of power in the following options:

(1) A primary battery with positive polarity is added in series with an isolation diode before being connected in parallel with the output side of a random input source (such as in the application of a calculator with a solar cell);

(2) A secondary (dis)chargeable battery is connected in

parallel with the output side of a random input source;

(3) A super capacity is connected in parallel with the output side of a random input source; or

(4) A voltage stabilization capacity is connected in parallel with the output side of a random input source;

However, these options are further found with the following defectives:

Option (1) is not very convenient since in the connection of the primary batter in parallel with the output side of the random input source, any insufficiency of electric energy in the primary battery requires immediate replacement.

For options (2) and (3), longer time of standby for recharging is required to receive the DC converted from the city power, or the solar cell or the windmill generation through the contact type of conduction structure for the rise up to normal working voltage, if the secondary (dis) chargeable batter or the super capacity functioning as the battery is at its low capacity. If a solar cell with higher capacity is used to simultaneously supply charging electric energy and loading electric energy, the installation of such a solar cell is comparatively expensive, consuming larger are and space to fail being practical and economic. Furthermore, it is far more difficult to control the immediate charging by relying on windmill generation.

Option (4) requires connection of a stabilizing capacity in parallel and if the capacity gets too small, it fails high density output or if the capacity becomes too high, the similar defectives found with Option (3) appear.

SUMMARY OF THE INVENTION

The primary purpose of the present invention is to provide a random input multistage voltage trickle storage system. To achieve the purpose, a circuit system functioning as a storage by voltage difference of two or more than two stages is comprised of two or more than two types of storage device, to store DC source converted from city power, or charging energy randomly inputted from unstable source such as a solar cell or a windmill generator to correct those defectives observed with the prior art.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block chart showing a circuit of the present invention;

Fig. 2 is a view showing a circuit to regulate and limit inputted electric energy in Fig. 1 is comprised of a voltage and amperage regulation circuit;

Fig. 3 is a view showing a circuit to regulate and limit inputted electric energy in Fig. 1 is comprised of an amperage regulation circuit;

Fig. 4 is a view showing a circuit to regulate and limit inputted electric energy in Fig. 1 is comprised of a voltage regulation circuit;

Fig. 5 is a view showing a circuit to regulate and limit inputted electric energy is comprised of a DC source taken from Fig. 1 connected first in parallel with a zener diode before being connected in series with an isolation diode in the positive direction of the current;

Fig. 6 is a view showing a circuit to regulate and limit inputted electric energy is comprised of a DC source taken from Fig. 1 connected in series with an isolation diode in the positive

direction of the current;

Fig. 7 is a view showing a circuit to regulate and limit inputted electric energy is comprised of a DC source taken from Fig. 1 having its both terminals connected in parallel with an isolation diode;

Fig. 8 is a view showing a circuit that a primary battery taken from Fig. 1 is comprised of a capacity or a super capacity;

Fig. 9 is a view showing a circuit that a primary battery taken from Fig. 1 is comprised of a (dis)chargeable secondary battery;

Fig. 10 is a view showing a circuit that in the circuit taken from Fig. 1, a diode is connected in series with a circuit 108 with its outputted current that can be regulated and controlled;

Fig. 11 is a view showing that the circuit taken from Fig. 1 is comprised of a zener diode and contains a charging operation and control circuit, and a circuit to limit one-way outputted electric energy;

Fig. 12 is a view showing that in the circuit taken from Fig. 1, a secondary batter is comprised of a capacity or a super capacity;

Fig. 13 is a view showing that in the circuit taken from Fig. 1, a secondary batter is comprised of a (dis)chargeable secondary battery;

Fig. 14 is a view showing that in the circuit taken from Fig. 1, a circuit to operate and control charging is not provided, instead, a secondary batter is comprised of a primary or a (dis)chargeable secondary battery or any other (dis)chargeable storage device; and

Fig. 15 is a view showing that in the circuit taken from

Fig. 1, a circuit to operation and control charging is not provided and a circuit to regulate and limit inputted electric energy may be omitted, instead, a diode is used as a circuit to limit the one-way outputted electric energy, and a secondary battery is comprised of a primary battery or a (dis)chargeable secondary battery or any other (dis)chargeable storage device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Fig. 1, a random input multistage voltage trickle storage system is essentially comprised of:

- a DC source 100: related to a DC source comprised of a contact type conduction device and rectified city power for random coupling to supply DC power at random, or to a DC source from a solar cell, windmill generation or any other unstable DC source, or a DC source converted from AC source, such as that unstable DC source converted from tide or vibration energy;
- a circuit 101 to regulate and limit inputted electric energy: comprised of a diode or other one-way current transmission device or circuit, e.g., an electro-mechanical device, or a controllable power chip or a gate current, or other one-way current transmission solid state circuit device or circuit, to regulate and control voltage and amperage outputted from the DC source to a storage unit 102, and to ensure that the electric energy can only be outputted from the DC source 100 to each storage unit and output terminal as any input to the DC source 100 is prevented; and the circuit 101 is optional; and
- a storage unit 102: containing a first storage device 103 comprised of a capacity or a super capacity or a secondary

battery, to be connected in parallel with the DC source 100 and output terminal, and the output terminal of the first storage device 103 may be further connected in series with an isolation diode 104 in the positive direction as required by the circuit; a second storage device 105 provided with a capacity, or super capacity, or a primary battery or a secondary battery, connected first in series with a one-way electric energy output limiting circuit 106, the in parallel with the power source and output terminal; a circuit 108 to regulate and control outputted amperage provided with the one-way electric energy output limiting circuit 106 and comprised of a diode 107 or other one-way current transmission device or circuit, e.g., an electro-mechanical device or controllable power chip or gate current, or other one-way current transmission solid state circuit device or circuit, so to ensure that the secondary battery device can only output electric energy to the source side and load side connected in parallel as the electric energy input the secondary battery device is prevented; and a charging operation and control circuit 111 comprised of a positive bias of a diode 109, or a zener diode 110, or an electro-mechanical device or solid state circuit device, that is connected in parallel with both terminals of the one-way electric energy output limiting circuit 106, to operate and control setting up the voltage for the DC source to commence charging the second storage device 105, or to further limit its charging current and to convert its charging saturation to the status of maintaining charging or circuit breaking when the second storage 105 is comprised of a capacity, a super capacity or a (dis)chargeable secondary battery or other chargeable

storage device; in practice, the charging control and operation circuit is optional.

Fig. 2 is a view showing a circuit to regulate and limit inputted electric energy in Fig. 1 is comprised of a voltage and amperage regulation circuit; within, an optional circuit for regulating voltage and amperage comprised of electro-mechanical device or solid state electronic device may be provided between the DC source 100 and the storage unit 102 to operate and control the voltage and current outputted from the DC source 100 for limit or constant voltage and limit or constant current to be outputted to the first storage device 103 of the storage unit 102, and if the optional isolation diode 104 is connected in series, such current and voltage is further outputted to the next stage of storage circuit connected in parallel and comprised of the second storage device 105 and the one-way electric energy output limit circuit 106 for further output.

Fig. 3 is a view showing a circuit to regulate and limit inputted electric energy in Fig. 1 is comprised of an amperage regulation circuit; wherein, an optional current regulation circuit comprised of electro-mechanical device or solid state electronic device is provided between the DC source 100 and the first storage device 103 of the storage unit 102, to execute operation and control of limit or constant current on the output from the DC source 100 before being further outputted to the first storage device 103 of the storage unit 102; and if the optional isolation diode 104 is connected in series, further outputted to the next storage circuit connected in parallel and comprised of the second storage device 105, the one-way electric energy output limit circuit 106 and a charging

operation and control circuit 111 for further output.

Fig. 4 is a view showing a circuit to regulate and limit inputted electric energy in Fig. 1 is comprised of a voltage regulation circuit; within, an optional voltage regulation circuit comprised of electro-mechanical device or solid state electronic device is provided between the DC source 100 and the first storage device 103 of the storage unit 102, to execute operation and control of limit or constant voltage on the output from the DC source 100 before being further outputted to the first storage device 103 of the storage unit 102; and if the optional isolation diode 104 is connected in series, further outputted to the next storage circuit connected in parallel and comprised of the second storage device 105, the one-way electric energy output limit circuit 106 and a charging operation and control circuit 111 for further output.

Fig. 5 is a view showing a circuit to regulate and limit inputted electric energy is comprised of a DC source taken from Fig. 1 connected first in parallel with a zener diode before being connected in series with an isolation diode in the positive direction of the current; wherein, a zener diode 112 is directly connected in parallel with both terminals of the DC source 100 (a drop resistance may be connected in series before the connection of the zener diode 112 if required), then the isolation diode 113 is connected in series in the positive direction of the current before being outputted to the first storage device 103 of the storage unit 102, and if the optional isolation diode 104 is connected in series, further outputted to the next storage circuit connected in parallel and comprised of the second storage device 105, the one-way electric energy output limit circuit 106 and a charging operation and control

circuit 111 for further output.

Fig. 6 is a view showing a circuit to regulate and limit inputted electric energy is comprised of a DC source taken from Fig. 1 connected in series with an isolation diode in the positive direction of the current; the isolation diode 113 is connected in series in the positive direction of the current with the DC source 100, then outputted to the first storage device 103 of the storage unit 102, and if the optional isolation diode 104 is connected in series, further outputted to the next storage circuit connected in parallel and comprised of the second storage device 105, the one-way electric energy output limit circuit 106 and a charging operation and control circuit 111 for further output.

Fig. 7 is a view showing a circuit to regulate and limit inputted electric energy is comprised of a DC source taken from Fig. 1 having its both terminals connected in parallel with an isolation diode; wherein, the zener diode 112 is directly connected in parallel with both terminals of the DC source 100 (a drop resistance may be connected in series before the connection of the zener diode 112 if required) then outputted to the first storage device 103 of the storage unit 102, and if the optional isolation diode 104 is connected in series, further outputted to the next storage circuit connected in parallel and comprised of the second storage device 105, the one-way electric energy output limit circuit 106 and a charging operation and control circuit 111 for further output.

Fig. 8 is a view showing a circuit that a primary battery taken from Fig. 1 is comprised of a capacity or a super capacity; wherein, the capacity or super capacity 114 provides the storage function for the first storage device 103.

Fig. 9 is a view showing a circuit that a primary battery taken from Fig. 1 is comprised of a (dis)chargeable secondary battery; wherein, the (dis)chargeable secondary battery provides storage function for the first storage device 103.

Fig. 10 is a view showing a circuit that in the circuit taken from Fig. 1, a diode is connected in series with a circuit 108 with its outputted current that can be regulated and controlled; wherein, the diode 107 is connected in series with the circuit 108 to regulate and control the outputted current, before being connected in parallel with the charging operation and control circuit 111 in the same direction of the current, and further connected in series with the second storage device 105 for the charging operation and control circuit 111 to control the charging current of the second storage device 105, and for the circuit 108 and the diode 107 to regulate and control its output current.

Fig. 11 is a view showing that the circuit taken from Fig. 1 is comprised of a zener diode and contains a charging operation and control circuit, and a circuit to limit one-way outputted electric energy; wherein the circuit is comprised of the zener diode 115 while containing the functions of that from the charging operation and control circuit 111 and one-way electric energy output limit circuit 106; wherein, the zener diode 115 provides the functions of that from the charging operation and control circuit 111 and the one-way electric energy output limit circuit 106, within, the zener voltage function of the zener diode 115 is used to provide the function of the charging operation and control circuit to limit the voltage, and an output route is created by the diode effect in reverse direction of the zener diode 115.

Fig. 12 is a view showing that in the circuit taken from Fig. 1, a secondary batter is comprised of a capacity or a super capacity; wherein, the second storage device 105 is comprised of the capacity or the super capacity 116.

Fig. 13 is a view showing that in the circuit taken from Fig. 1, a secondary batter is comprised of a (dis)chargeable secondary battery; wherein, the second storage device 105 is comprised of any type of (dis)chargeable secondary batter 117.

Fig. 14 is a view showing that in the circuit taken from Fig. 1, a circuit to operate and control charging is not provided, instead, a secondary batter is comprised of a primary or a (dis)chargeable secondary battery or any other (dis)chargeable storage device; wherein, the charging operation and control circuit 111 is not provided; instead, the second storage device 105 is comprised of a primary or (dis)chargeable secondary battery or any other (dis)chargeable storage device.

Fig. 15 is a view showing that in the circuit taken from Fig. 1, a circuit to operation and control charging is not provided and a circuit to regulate and limit inputted electric energy may be omitted, instead, a diode is used as a circuit to limit the one-way outputted electric energy, and a secondary battery is comprised of a primary battery or a (dis)chargeable secondary battery or any other (dis)chargeable storage device, wherein, both of the charging operation and control circuit 111 and the optional circuit 101 to regulate and limit the inputted electric energy are omitted; instead, the function of the one-way electric energy output limit circuit 106 is provided by the diode 107 and the second storage device 105 is comprised of a primary or (dis)chargeable secondary battery or any other (dis)chargeable storage device.

All the preferred embodiments of the random input multistage trickle storage system of the present invention are cost efficient and compact when compared to the prior art. Given with a solar cell with its output voltage 3v, amperage 5 ma, and a working current 400 ma for the pulse load of the power controlled device, the solar cell is not capable for directly driving the load and an auxiliary storage device must be added. If the auxiliary storage device has a smaller capacity, it means frequent recharging is required for each round or a few rounds of operation and control. Another flaw is found that during the intermittent operation and a longer time of standby is available for recharging, but the electric energy to be recharged is very limited due to earlier saturation for the smaller capacity. On the contrary, if a super capacity or a secondary battery with larger capacity is used, the defective in its operation is that a longer time will be required for the recharging when the voltage of the battery is at low upon start-up.

Should the random input multistage voltage trickle storage system of the present invention be applied in random coupling in a structure provided with a contact type conduction structure, or in a intermittent power control device driven by a solar cell such as a calculator, remote controller, mouse, keyboard or any other cordless power controlled peripherals, the present invention offers the following improvements:

- whereas the system of the present invention is provided with a first storage device and a second storage device and the latter is comprised of a super capacity or a secondary charging batter of larger capacity, immediate operation upon start-up is possible in the presence of sufficient voltage from the

second storage device; if such sufficient voltage from the second storage device is not available, the first storage device with the smaller capacity has the top priority to be charged by the solar cell to make start-up operation soonest possible disregarding how low the voltage from the first storage device; on the contrary, under the same conditions, a longer stand-by upon start-up is required in the conventional circuit for lacking in such random input multistage voltage trickle storage system, and the operator has to wait up its single high capacity storage device being charged to reach the working voltage;

- during the longer subsequent period to receive the optical energy by the solar cell, the first storage device with lower storage capacity is first charged up to the preset voltage, then the second storage device is automatically and immediately charged for storage of more electric energy.

Furthermore, as may be required by the operation, the random input multistage voltage trickle storage system allows the following options for its first storage device 103, the second storage device 105, the one-way electric energy output limit circuit 106 and the charging operation and control circuit 111:

- the relationship of storage capacity among the storage devices is as follows: the storage capacity of the first storage device 103 < the storage capacity of the second storage device 105 < the storage capacity of the third storage device < … and so on to constitute a multistage DC supply system of unstable source;
- with the exception of the first storage device, the one-way electric energy output limit circuit 106 and the charging operation and control circuit 111 both have to be added in

series with the second storage device and any storage device of subsequent stage;

- the one-way electric energy output limit circuit 106 and the charging operation and control circuit 111 are connected in parallel, then respectively connected in series with the second storage device 105 and the third storage device or any subsequent storage device; so that after the first storage device 103 has been charged to its preset voltage, the charging is immediately and automatically provided to the second storage device 105; in turn, when the second storage device 105 is charged up to its preset voltage, the charging is immediately and automatically provided to the third storage device, and so on to constitute the random input multistage voltage trickle storage system;
- a charging source to first charge the first storage device 103, then the second storage device 105, and so to constitute the random input multistage voltage trickle storage system; and
- the one-way electric energy output limit circuit 106 and the charging operation and control circuit 111 are connected in parallel, then respectively connected in series with the second storage device 105 and the third storage device or any subsequent storage device so for the first storage device 103, the second storage device or any additional storage device of the subsequent stage to jointly supply the power to the load.

All the preferred embodiments of the present invention and their application disclosed above are for the description of their working principles and shall not be deemed as conclusive to limit any other combination which may be selected by following

those principles in practical applications.

A random input multistage voltage trickle system of the present invention by offering the operation and control characteristics of multistage voltage trickle storage improving the instant power supply to the system load is innovative. Therefore, this application is duly filed accordingly.